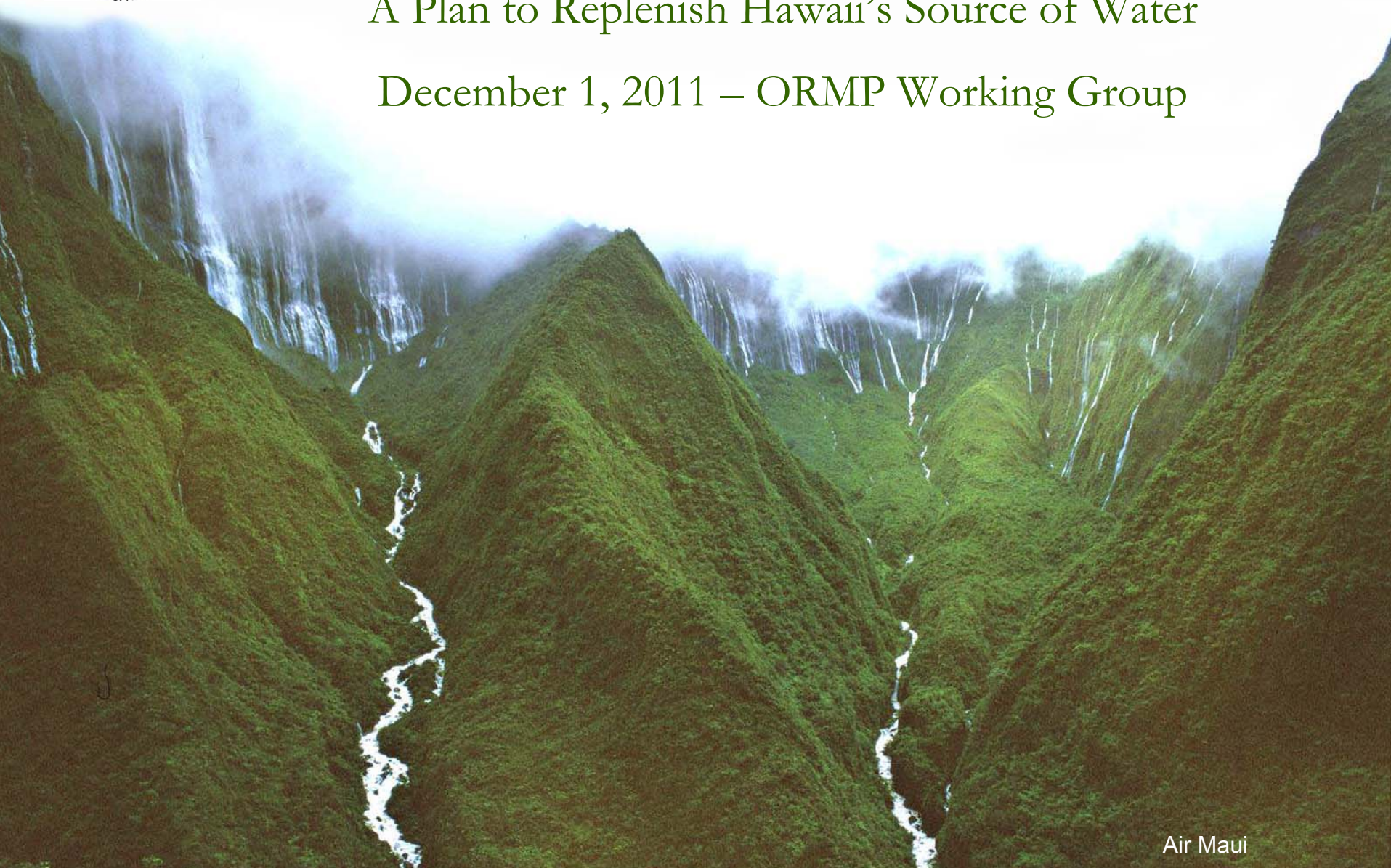
The Rain Follows The Forest

A Plan to Replenish Hawaii's Source of Water

December 1, 2011 – ORMP Working Group



Air Maui

Ocean Resources Management Plan

- ***Reduce soil erosion from upland forest ecosystems and conservation lands:***
  - Implement and monitor best management practices to reduce upland soil erosion caused by feral animals, loss of native forest species, and other anthropogenic factors
  - Expand watershed partnerships and similar public-private partnerships to improve management of upland forest ecosystems and conservation lands
  - Leverage State, federal, and private sector funding to implement best management practices

Ocean Resources Management Plan

- ***Reduce soil erosion from upland forest ecosystems and conservation lands:***
  - Implement and monitor best management practices to reduce upland soil erosion caused by feral animals, loss of native forest species, and other anthropogenic factors
  - Expand watershed partnerships and similar public-private partnerships to improve management of upland forest ecosystems and conservation lands
  - Leverage State, federal, and private sector funding to implement best management practices

Action Plan

- Remove all invasive hooved animals from priority I and II areas.

Action Plan

- Remove or contain damaging invasive weeds that threaten priority I and II areas

Dense strawberry guava thicket invading a native forest.

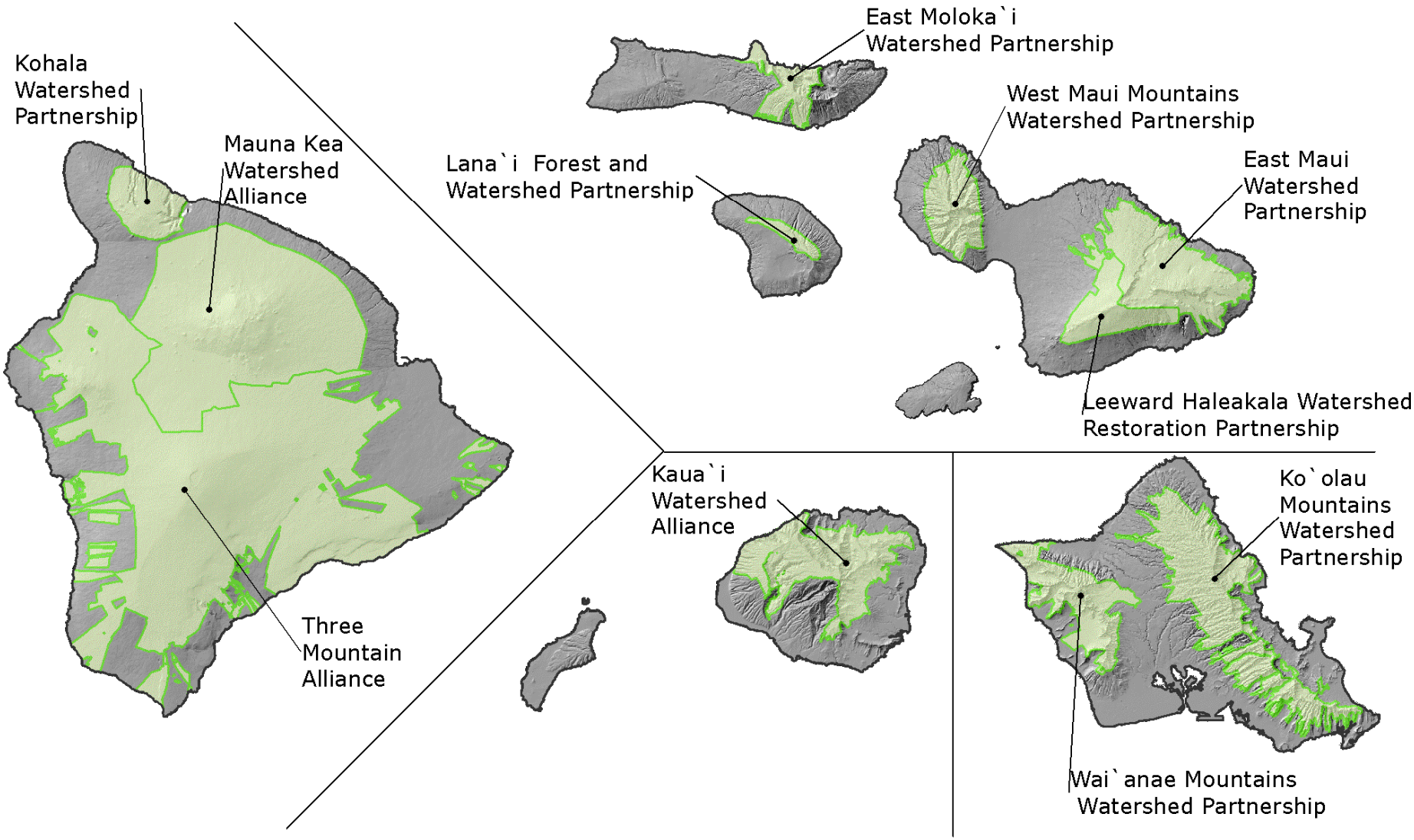
Action Plan

- Monitor and control other forest threats including fires, predators, and plant diseases.
- Restore native species.
- Establish benchmarks and monitor success.
- Educate Hawaii's residents and visitors about the cultural, economic, and environmental importance of conserving native forests.
- Promote consistent and informed land use decision-making that protects watersheds.

Ocean Resources Management Plan

- ***Reduce soil erosion from upland forest ecosystems and conservation lands:***
  - Implement and monitor best management practices to reduce upland soil erosion caused by feral animals, loss of native forest species, and other anthropogenic factors
  - Expand watershed partnerships and similar public-private partnerships to improve management of upland forest ecosystems and conservation lands
  - Leverage State, federal, and private sector funding to implement best management practices

Hawaii's Watershed Partnerships



Ocean Resources Management Plan

- ***Reduce soil erosion from upland forest ecosystems and conservation lands:***
  - Implement and monitor best management practices to reduce upland soil erosion caused by feral animals, loss of native forest species, and other anthropogenic factors
  - Expand watershed partnerships and similar public-private partnerships to improve management of upland forest ecosystems and conservation lands
  - Leverage State, federal, and private sector funding to implement best management practices

Ocean Resources Management Plan

Funding

Multiple benefits of watershed protection:

-Water recharge

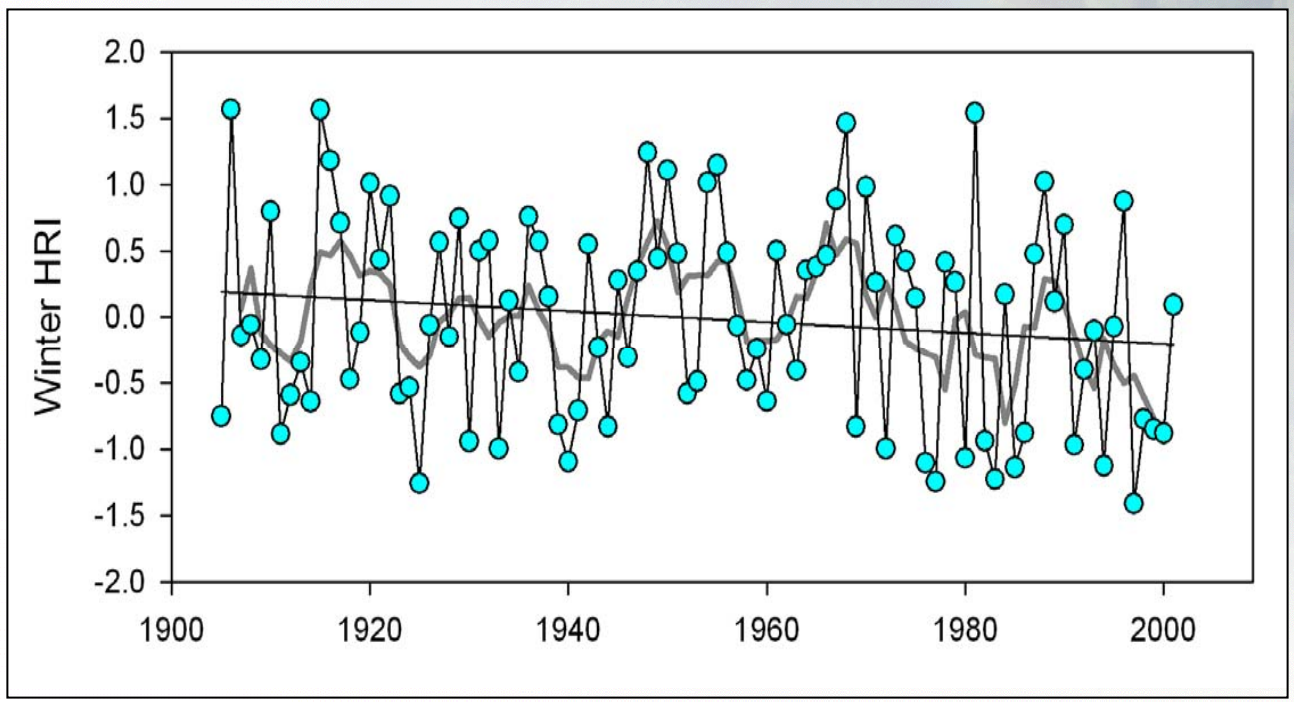
-Erosion and sedimentation control

-Native ecosystems and culture

-Greenhouse gas emission reductions

Hawaii's Water Supply is at Risk

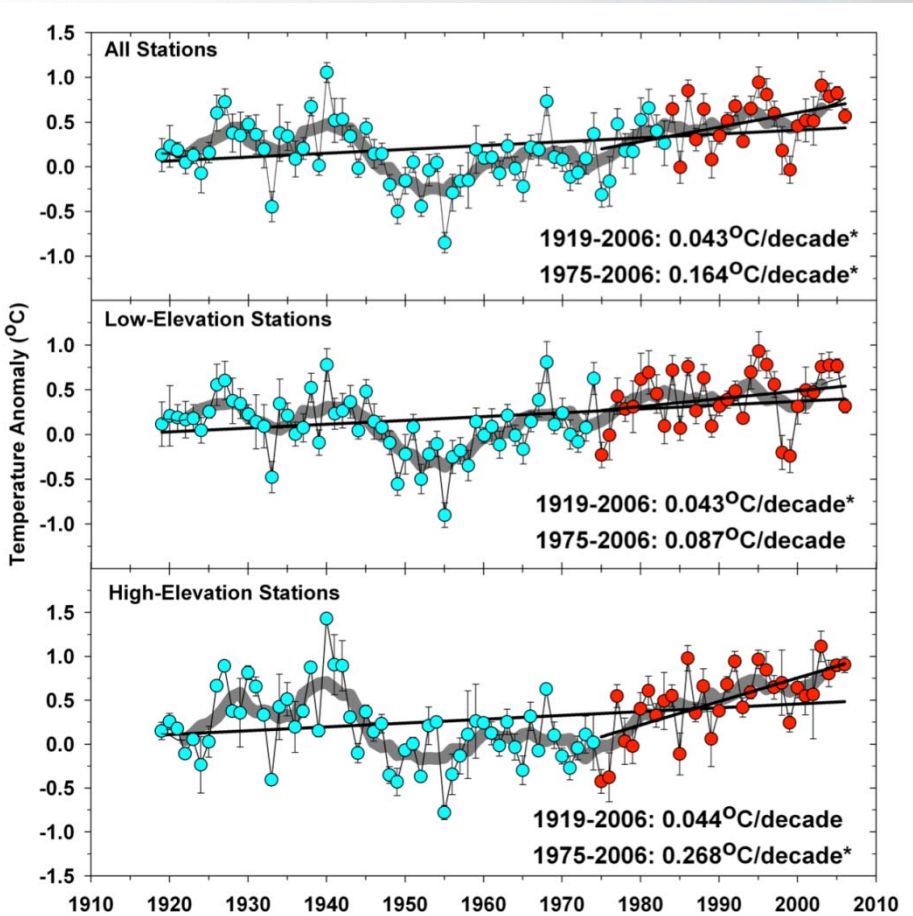
Evidence of Long-term Decline in Rainfall



Chu, P.-S., and Chen, H. 2005. Interannual and interdecadal rainfall variations in the Hawaiian Islands. *Journal of Climate* 18: 4796-4813.

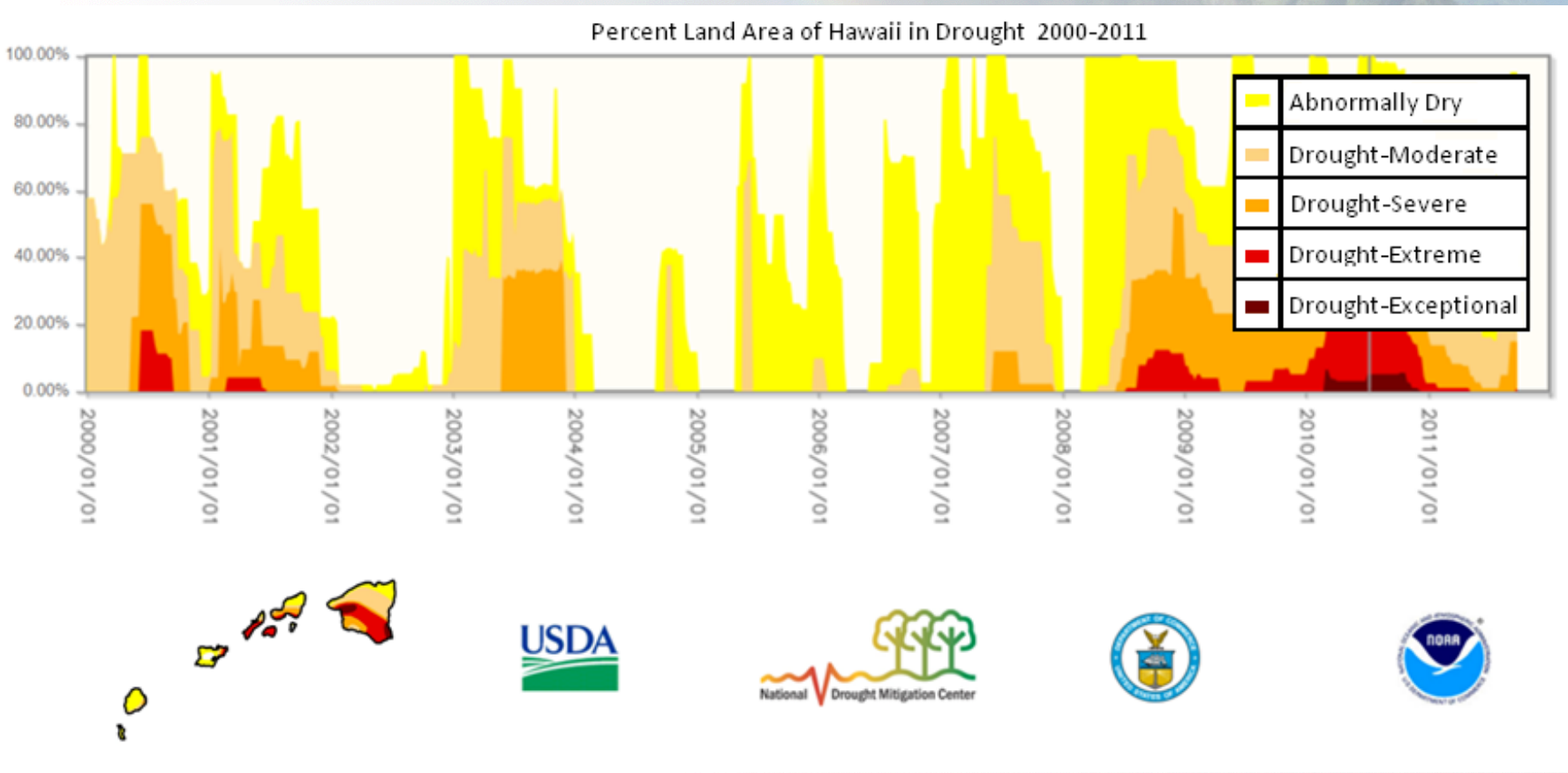
Hawaii's Water Supply is at Risk

Hawaii Temperature



Giambelluca, T.W., Diaz, H.F., and Luke, M.S.A. 2008. Secular temperature changes in Hawai'i. *Geophysical Research Letters* 35, L12702, doi:10.1029/2008GL034377.

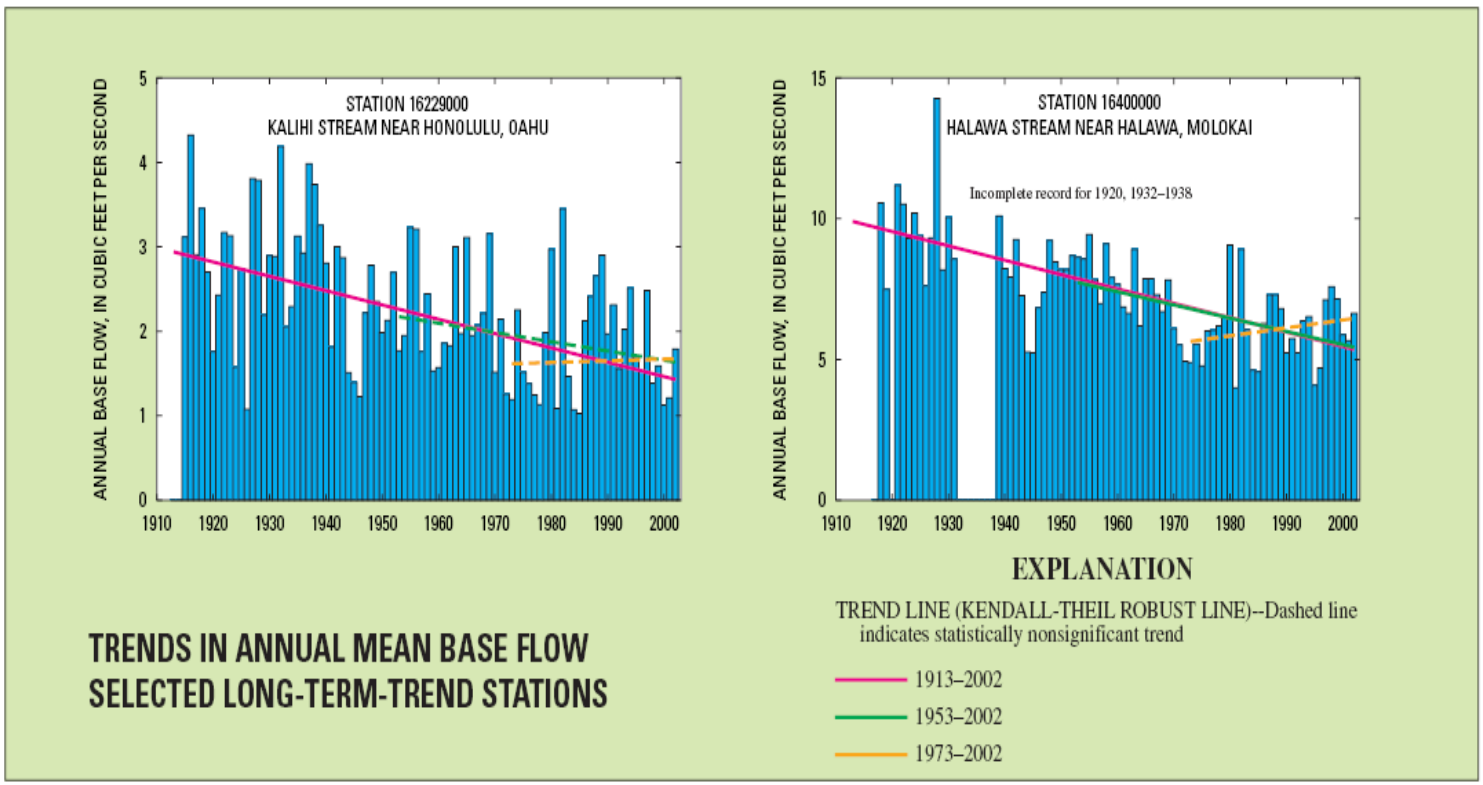
Hawaii's Water Supply is at Risk



U.S. Drought Monitor

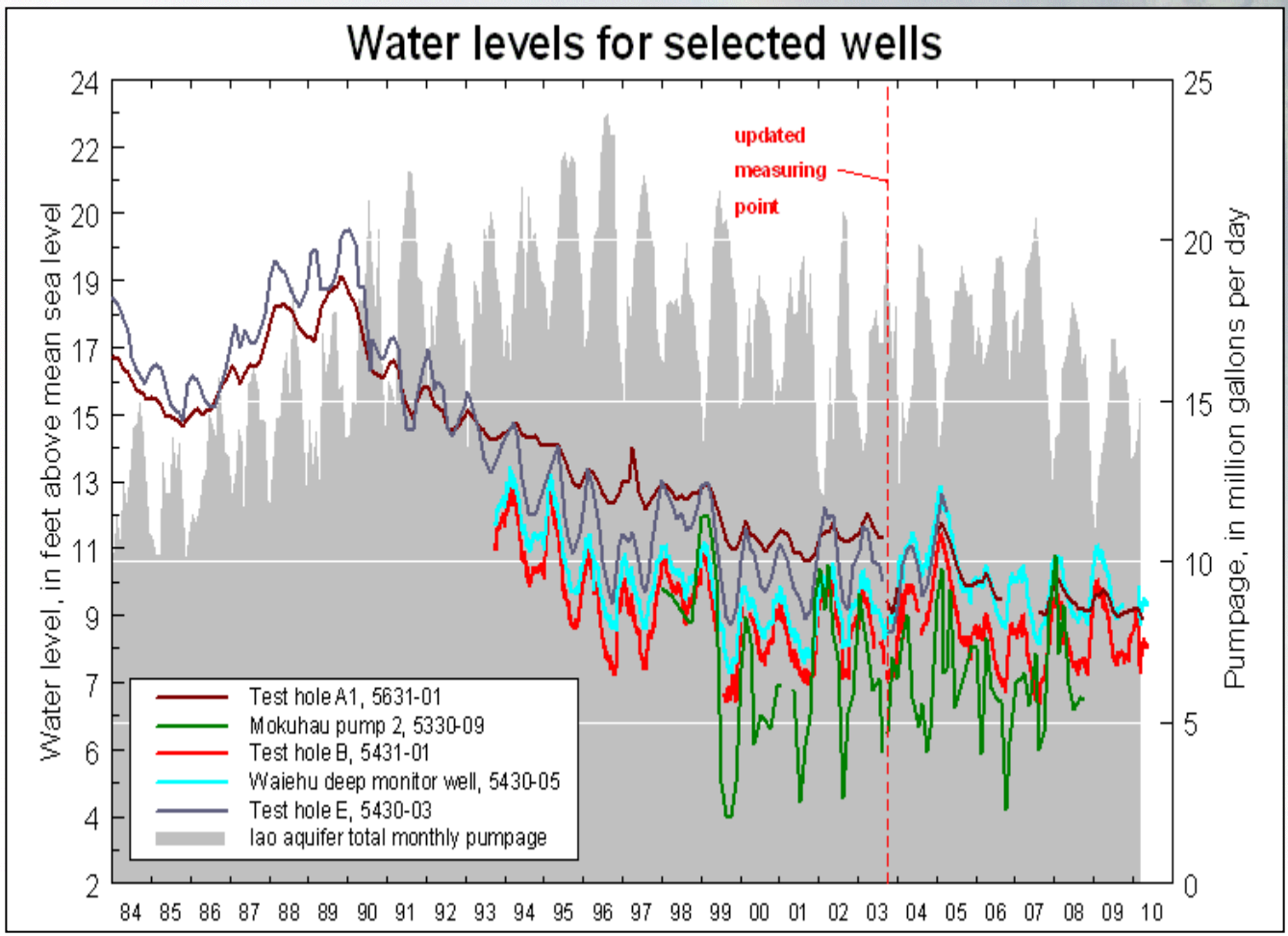
Hawaii's Water Supply is at Risk

Stream Base Flow in Decline



Oki, D.S., 2004, Trends in Streamflow Characteristics in Hawaii, 1913-2003: U.S. Geological Survey Fact Sheet 2004-3104, 4 p.

Hawaii's Water Supply is at Risk

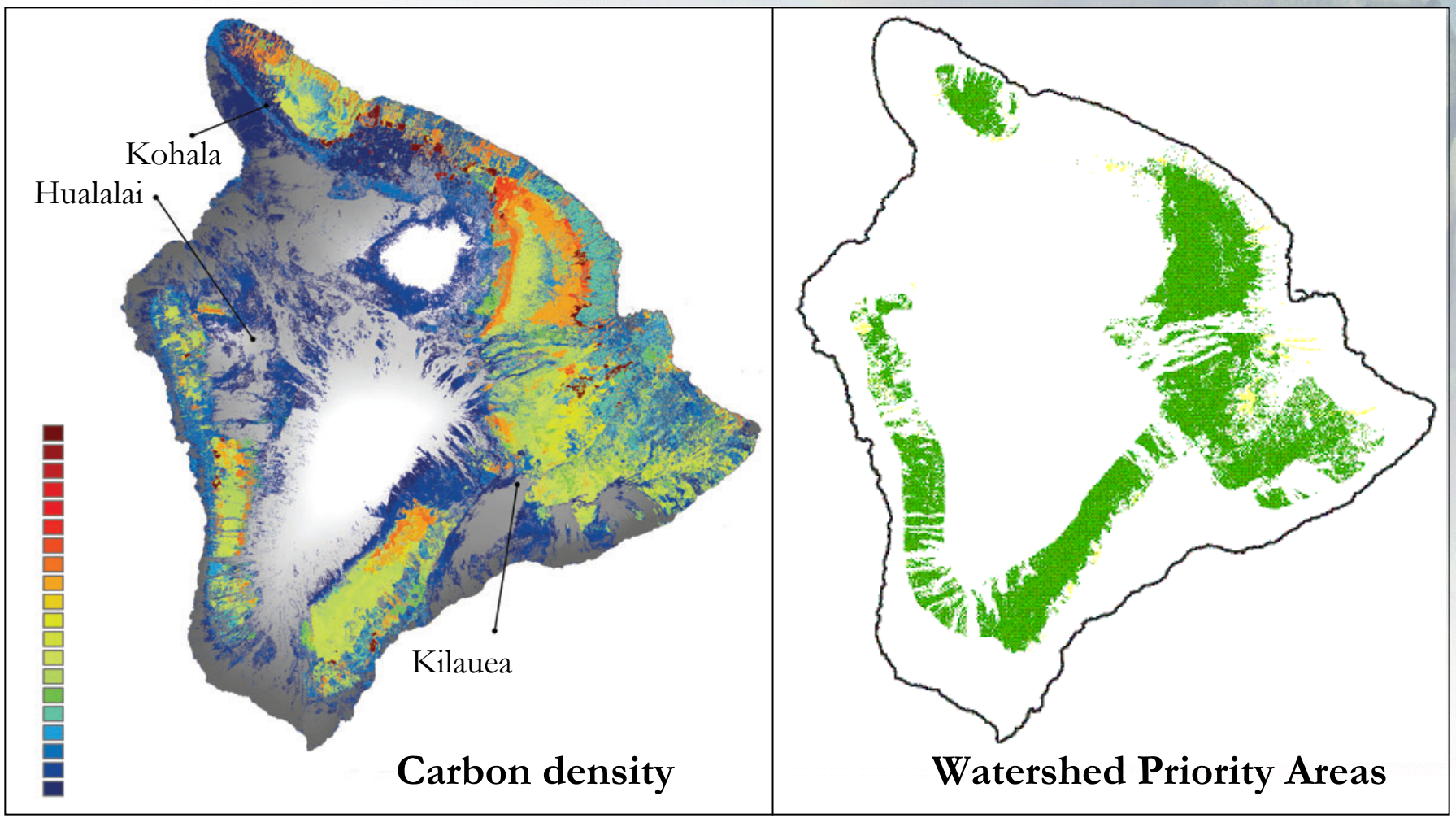


Benefits of Forest Watershed Protection

Forests capture rain and cloudwater

- Forests can increase water capture by up to 30%
  - 1% loss of recharge in the Ko`olau Mtns costs $42 million
  - Invasive plants reduce estimated groundwater recharge in East Hawaii by 85 million gallons/day
  - Desalination plant planned for `Ewa will cost $40 million to construct and $5 million annually to produce 5 million gallons/day

Benefits of Forest Watershed Protection

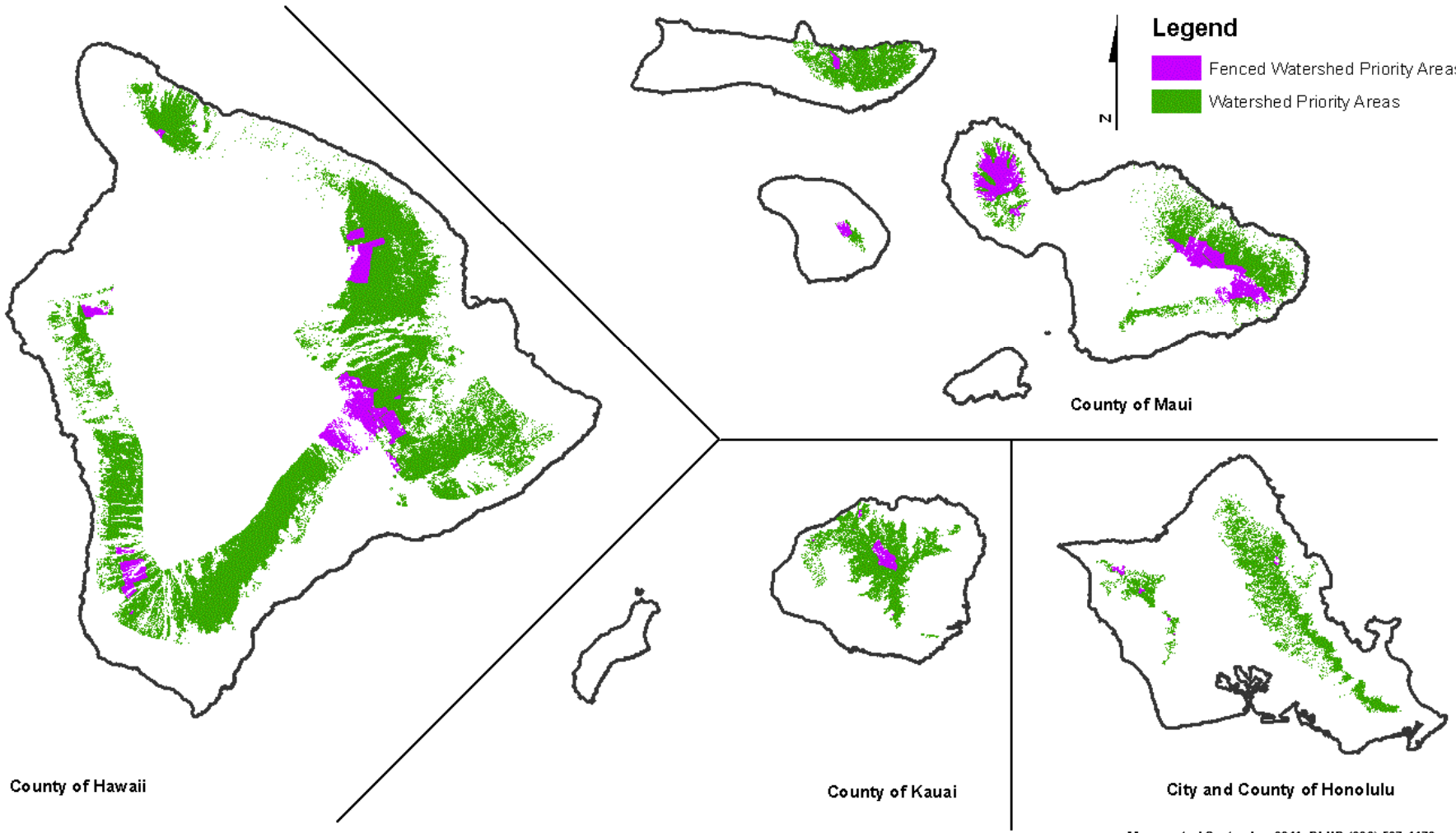


Asner, G. P., R. F. Hughes, J. Mascaro, A. L. Uowolo, D. E. Knapp, J. Jacobson, T. Kennedy-Bowdoin, and J. K. Clark. 2011. High-resolution carbon mapping on the million-hectare island of Hawai'i. Frontiers in Ecology and the Environment 9:434-439


WMMWP

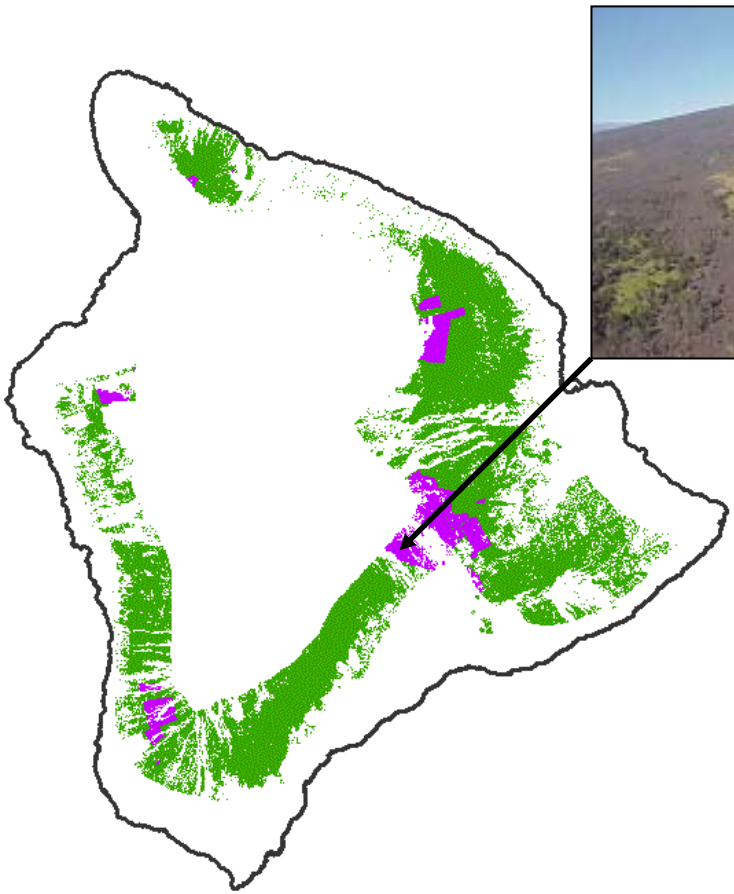
Benefits of Forest Watershed Protection

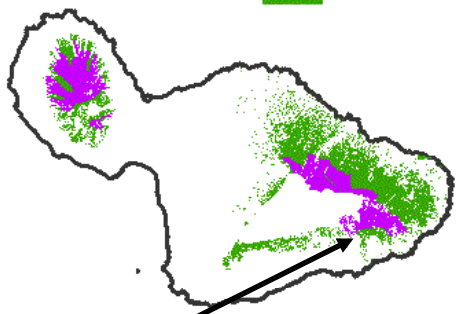
Watershed Priority Areas



Map created September 2011. DLNR (808) 587-4170.

Watershed Priority Areas





Legend

- Fenced Watershed Priority Areas
- Watershed Priority Areas

Action Plan

- DLNR's Goal
  - Double acreage protected in next 10 years
  - Requires investment of approximately $11 million per year
  - Fund approximately 150 FTE natural resource careers
  - This level of effort, or more, needed in perpetuity to stabilize Hawaii's water source

Methodology

Managed

Unmanaged

Evapotranspiration

Runoff/Erosion

Methodology

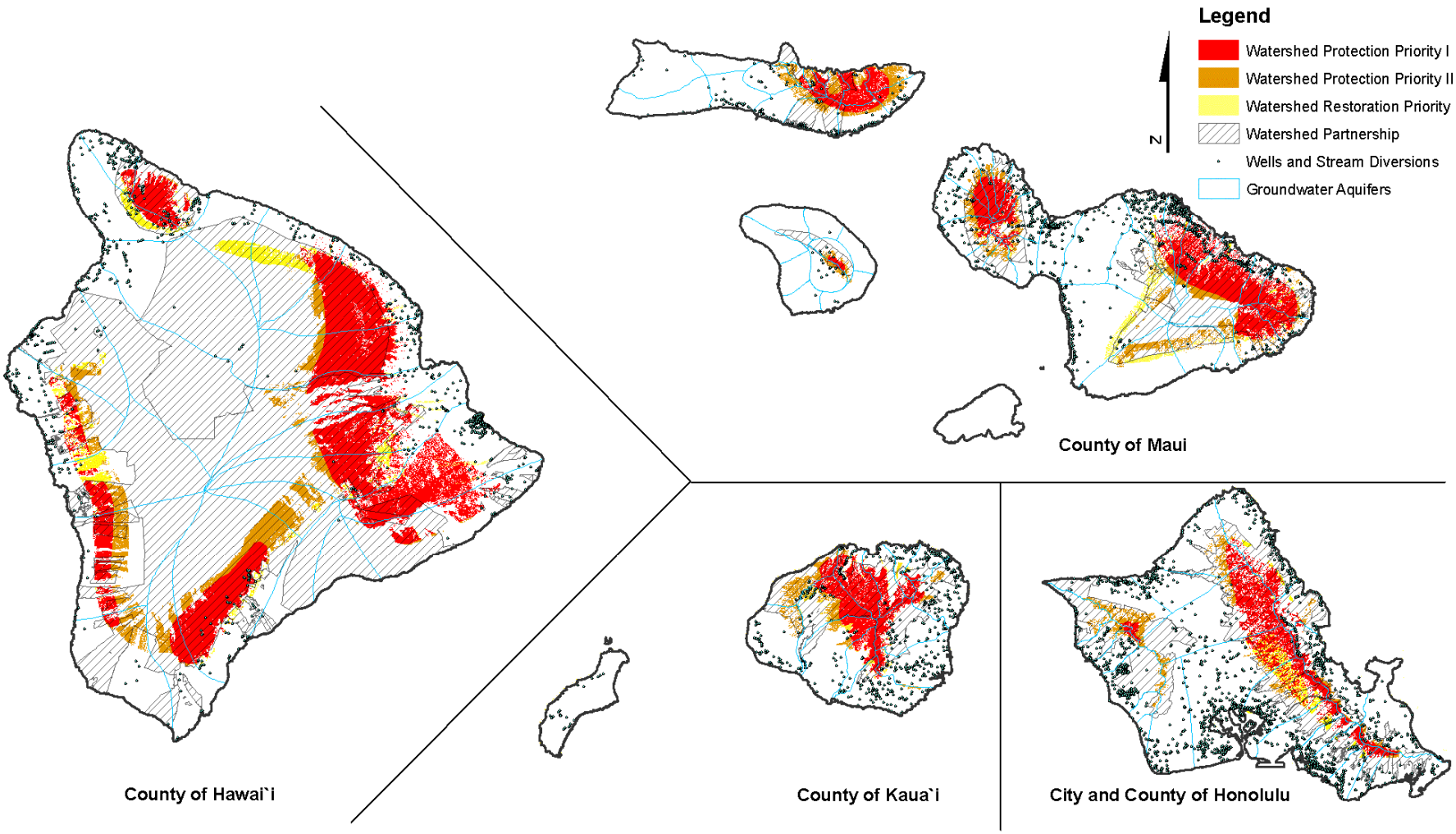
Managed

$$

$

Unmanaged

Priority Watershed Areas



See Appendix II for methodology.
Map created November 2011. DLNR (808) 587-4170.

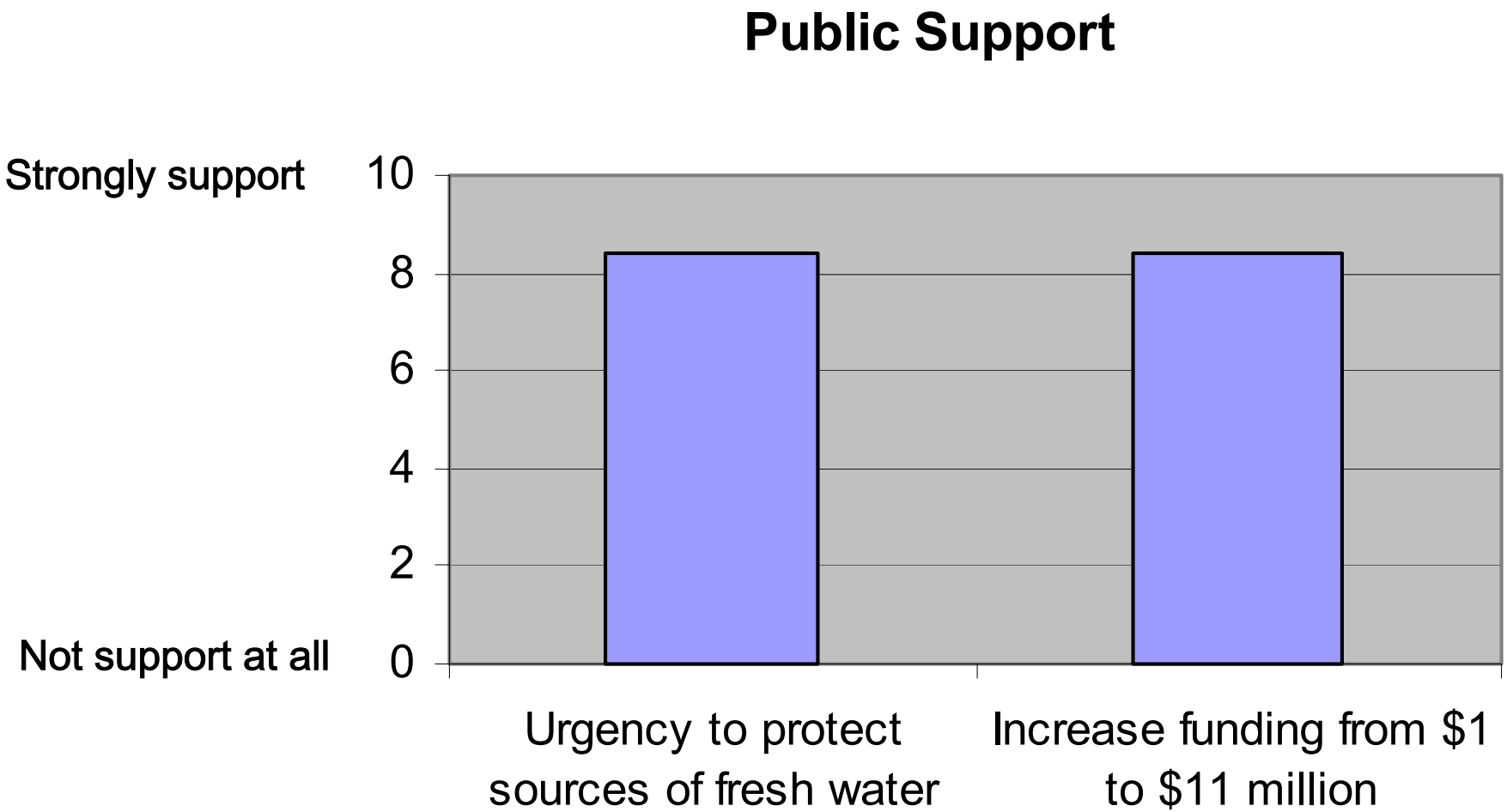
Funding

- Dedicated funding needed
- Watershed protection benefits multiple sectors so identify many funding sources
- Funding from uses that depend on or are mitigated by watershed protection

Funding

- Visitor industries
- Water
- Climate change
  - Resiliency
  - Greenhouse gas emissions reduction

Polling


Public Support
Strongly support
Not support at all
10
8
6
4
2
0
Urgency to protect sources of fresh water
Increase funding from $1 to $11 million

Public Support

Watershed Contributions	Average	Theme
Capture rainfall and replenish fresh water supplies for our use	9.2/10	Water
Provide water for local agriculture	8.9/10	Water/Economy
Prevent erosion and runoff of sediment into our oceans	8.7/10	Oceans/Climate Change
Are of spiritual & cultural importance to native Hawaiian culture	8.1/10	Culture
Increase resistance to climate change by absorbing greenhouse gases	8.0/10	Climate Change
Support the visitor industry by providing the unique natural beauty that attracts tourists	7.9/10	Aesthetic/Economy

Public Support

Watershed Protection	Average	Theme
Hawaii's forests are important to Hawaii's fresh water supply	9.5/10	Water
Forests need protection because they are declining and home to native plants and wildlife found nowhere else on earth	9.0/10	Native Species
Invasive species must be kept to a minimum to protect the health of watershed forests	8.9/10	Invasive Species
Spending now to protect our forests saves taxpayer money in the long run	8.2/10	Economy


MAHALO
Hahai no ka ua i ka ulula`au
The rain always follows the forest
hawaii.gov/dlnr